

MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for May, 1897, is based on 2,927 reports from stations occupied by regular and voluntary observers, classified as follows: 143 from Weather Bureau stations; numerous special river stations; 33 from post surgeons, received through the Surgeon General, U. S. Army; 2,588 from voluntary observers; 96 received through the Southern Pacific Railway Company; 14 from Life-Saving stations, received through the Superintendent United States Life-Saving Service; 32 from Canadian stations; 1 from Hawaii; 20 from Mexican stations. International simultaneous observations are received from a few stations and used together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Government Survey, Honolulu; Dr. Mariano Bárcena, Director of the Central Meteorological Observatory of Mexico and Commander J. E. Craig, Hydrographer, United States Navy.

The REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe. Unless otherwise specifically noted, the text is written by the Editor, but the meteorological tables contained in the last section are furnished by Mr. A. J. Henry, Chief of the Division of Records and Meteorological Data.

CLIMATOLOGY OF THE MONTH.

GENERAL CHARACTERISTICS.

The month was remarkable for the unprecedented flood in the lower portion of the Mississippi River, which had, however, begun to decline at the close of the month. The rainfall in the upper watershed of the Rio Grande was remarkably heavy, thus preparing for the subsequent floods in the lower part of the river. The mean temperatures were the highest on record at several stations in the northern Plateau and north Pacific Slope and California. It was the lowest on record at several stations in Indiana, Ohio, Kentucky, and Tennessee.

ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers, not reduced to standard gravity, and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart IV. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The mean pressure during the current month was highest off the coast of Washington and Oregon; it was lowest in Arizona, and low in eastern Montana.

The highest reduced pressures were: In the United States, Tatoosh Island, 30.10; Fort Canby and Eureka, 30.07; Seattle, Des Moines, Kansas City, St. Louis, Knoxville, Chattanooga, New Orleans, Mobile, Pensacola, and Charleston, 30.06. In Canada, Bermuda, 30.14; Halifax, 30.05; Sydney, 30.04. The lowest were: In the United States, Yuma, 29.76; Phoenix, 29.77; Fresno, 29.86; Havre, 29.88; Miles City, 29.89. In Canada, Prince Albert, 29.83; Edmonton, Swift Current, and Rockcliffe, 29.92.

As compared with the normal for May, the mean pressure

was generally in excess, except slight deficiencies in Oregon California, and the Lake Region.

The greatest excesses were: In the United States, Wichita, 0.13; Oklahoma, Kansas City, and Des Moines, 0.12; Bismarck, St. Louis, Dodge City, Amarillo, and Abilene, 0.10. In Canada, Bermuda and Halifax, 0.08; Sydney, Minnedosa, and Calgary, 0.07. The deficits were: In the United States, Yuma, 0.08; Oswego, 0.05; Portland, Oreg., Roseburg, and Fresno, 0.04. In Canada, Rockcliffe, Kingston, and Toronto, 0.02.

As compared with the preceding month of April, the pressures reduced to sea level show a slight rise in Iowa and Missouri, Cape Breton, and Newfoundland, but a fall in all other regions.

The greatest rises were: In the United States, Omaha, 0.03; Des Moines, Kansas City, and Wichita, 0.02. In Canada, St. Johns, N. F., 0.07; Sydney, 0.03. The greatest falls were: In the United States, Salt Lake City, 0.18; Fresno, 0.16; Idaho Falls, Winnemucca, and Red Bluff, 0.15; Carson City, Harrisburg, New York, Atlantic City, and Hatteras, 0.14. In Canada, Kingston, 0.12; Ottawa, Rockcliffe, Parry Sound, Toronto, Saugeen, 0.11.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During the month the apparent paths of seven highs and eleven lows were sufficiently well defined to be traced on the accompanying charts, I and II. The following table gives the principal facts regarding the origin, movement, and point of disappearance of these highs and lows.

The following general remarks are added: The highs and lows of the month have been remarkably well defined for this season of the year. The general transference has been quite uniform, except when starting in the Pacific or north of Montana.

HIGHS.

Numbers I and II began in the Lake Superior region, moved a little south of east, and were last seen on or near the south Atlantic Coast. VII began to the north of Montana, and was last noted over Lake Superior. The remaining highs separated from the permanent high in the Pacific. There was a singular motion, first northward up the Pacific Coast and then east and southeast toward the Atlantic.

LOWS.

Of the lows, VI and VIII began off the north Pacific Coast; II, VII, IX, and XI north of Montana in the sub-permanent low in that region. IV and V began near Lake Superior, III in Nevada, I in North Carolina, and X off the middle Atlantic Coast. The general path was to the north of the United States and across the Lakes.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.										
I.....	1, a. m.	49	93	7, a. m.	37	83	2,000	6.0	334	13.9
II.....	5, a. m.	50	86	10, a. m.	33	73	1,660	5.0	332	13.8
III.....	5, a. m.	36	123	20, a. m.	38	73	5,330	15.0	355	14.8
IV.....	15, p. m.	34	121	24, p. m.	48	60	5,540	9.0	616	25.7
V.....	20, p. m.	47	123	28, a. m.	31	81	4,820	7.5	642	26.8
VI.....	24, a. m.	41	126	29, p. m.	33	100	3,280	5.5	596	24.8
VII.....	28, a. m.	52	113	31, p. m.	50	90	1,230	3.5	381	15.9
Total.....							23,960	51.5	3,256	
Mean of 7 paths.....							3,428	7.4	465	19.4
Mean of 51.5 days.....									465	19.4
Low areas.										
I.....	1, a. m.	36	82	6, a. m.	36	74	1,660	5.0	332	13.9
II.....	2, p. m.	55	111	5, a. m.	48	97	1,030	2.5	418	17.1
III.....	4, p. m.	42	117	10, p. m.	47	75	2,890	6.0	481	20.0
IV.....	10, a. m.	46	97	13, p. m.	48	77	1,420	2.5	574	23.9
V.....	12, p. m.	47	91	15, a. m.	49	88	1,230	2.5	514	21.4
VI.....	12, p. m.	48	128	17, p. m.	49	106	2,110	5.0	422	17.6
VII.....	18, p. m.	52	108	22, p. m.	45	61	2,800	4.0	700	29.2
VIII.....	19, p. m.	48	136	25, p. m.	44	87	3,220	6.0	536	22.3
IX.....	23, p. m.	53	119	28, p. m.	37	88	2,780	5.0	557	23.2
X.....	27, a. m.	41	69	29, p. m.	49	71	860	2.5	346	14.4
XI.....	27, p. m.	53	114	31, p. m.	51	68	2,220	4.0	556	22.2
Total.....							22,920	45.0	5,431	
Mean of 11 paths.....							2,026	4.1	494	20.6
Mean of 45 days.....									493	20.5

LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

No severe tornado occurred within the United States during April and May, 1897, and there was an absence of minor tornadoes and violent thunderstorms that stands in marked contrast to the record of the same months in 1896. May, 1897, was unusually free from violent atmospheric disturbances.

March storms not heretofore reported: March 18, Texas, Tarrant County, 8:20 p. m., central time: no funnel, whirl, counter clock-wise, moved from southwest to northeast, no fatalities, property loss small.

March 31.—Arkansas: First observed near Orlando, Cleveland County, about 7 miles southeast of New Edinburgh, Ark.; path $\frac{1}{4}$ to $\frac{1}{2}$ mile wide; moved northeast. Observed again, near Star City, Lincoln County, and at Grady about 13 miles northeast of the latter. In all 7 persons, colored, were killed and probably a larger number injured. The path of the storm varied in width, and the length is not known. Property loss not large, probably not over \$10,000, aside from the loss to crops and standing timber.

A minor tornado was observed near Tuckerman, Jackson County, about 3:00 p. m. of the same date. No casualties and but small property loss.

April 1.—Missouri: Heavy rains and in places severe hail storms occurred.

3d.—Kansas: Topeka, 1 p. m., central time: a small funnel cloud formed over the corporate limits of Topeka and moved slowly northward, a little above the housetops. The damage was confined principally to chimneys and roofs. The funnel cloud was not more than 40 feet wide and at no time descended to the ground. Pedestrians were warned of its approach by a buzzing noise and had abundant opportunity to get out of the way. The funnel cloud was very black and the whirling was plainly visible, but no wind effects were noticed, except in the immediate track of the funnel.

7th.—Texas: Severe rain and hail storms visited the northern part of the State.

8th.—Indiana: Heavy rain and snow interrupted telephonic and telegraphic communication. Alabama and Georgia: Severe local storms occurred in Albany, Folkston, and Valdosta, Ga., and Ozark, Ala.; one life was lost by falling timbers at the last-named place.

19th.—Illinois and Michigan: High winds and gales prevailed over Lake Michigan and the adjacent territory; 5 persons were injured in Chicago by the falling of signs, derricks, etc.

22d.—Kansas: Four miles north of McFarland, Wabaunsee County, 8:45 p. m., central time: 1 killed, 7 injured; property loss about \$2,000; path from 50 to 200 feet wide, and 15 miles long; moved a little east of north. One mile west of Newton, 10:00 p. m., central time: no fatalities, 3 injured, property loss about \$2,000: moved a little east of north; path 150 feet wide and 12 miles long; destruction not continuous over the entire length.

23d.—Iowa: Anamosa, 8:50 p. m., central time: no casualties, property loss under \$5,000; path 300 feet wide, 5 miles long; moved a little east of north.

24th.—Michigan: Omer, Arenac County, 5:30 p. m., central time: 3 injured; property loss about \$4,800; path about 40 feet wide and a half mile long. Mr. C. F. Schneider, Section Director of the Michigan Climate and Crop Service, makes the following report upon the meteorological conditions on the day of the tornado:

The morning at Omer was clear and warm with a fresh southeast wind; toward noon the sky began to cloud over rapidly and the wind to increase in force. During the afternoon the clouds lowered and began to assume a threatening appearance, and the southeast wind increased to a gale of about 30 miles per hour. By 5:00 p. m. the sky was very dark and the wind had become strong enough to loosen signs and boards, and it had begun to shift to the south-southeast. At this time a violent thunderstorm set in, the thunder and lightning being continuous. The thunderstorm moved from the southwest to the northeast, and in advance of the tornado. About 5:15 p. m. a light sprinkle of rain fell for a few minutes, and this was followed by a light fall of small, opaque hailstones. During the half hour from 5:00 to 5:30 p. m., the wind continued to blow a gale from the south-southeast, and this wind was very warm and somewhat suffocating. At 5:30 p. m. (as near as can be determined) the tornado cloud suddenly made its appearance from the southwest.

This tornado cloud was typical in form, being described by such citizens as saw it, as "balloon shaped," or, as text books speak of such phenomena, "funnel shaped." It was about 40 feet high, its top having a steady forward movement, but the lower part of it, which corresponds to the basket or car of a balloon, had an unsteady motion, moving from side to side, and in advance, and sometimes in the rear of the body of the cloud. The whole cloud had a wavy horizontal movement, sometimes being nearly in contact with the earth, and then lifting up for some distance. It was accompanied by a peculiar roar.

May 8th.—Kansas: One mile west of Ulysses, 3 p. m., central time: no casualties; one building destroyed; path 100 yards wide, $\frac{1}{4}$ mile long.

May 9th.—Arkansas: Corning, 5 p. m., central time: no casualties; property loss about \$200; width of path 200 to 300 yards, length, 2 miles; moved northeast.

TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

Both the mean temperatures and the departures from the normal are given in Table I for the regular stations of the